

EXAMINATION OF LYMPH NODES AND CERVICOFACIAL LYMPHADENOPATHY



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 - Description of lymph nodes
 - Function of lymph nodes
 - Distribution of lymph nodes
 - Lymphadenopathy
 - Causes of lymphadenopathy
 - Pathogenesis of lymphadenopathy
 - Clinical evaluation of lymphadenopathy
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Introduction

- Early recognition of disease almost always improves prognosis for recovery.
- Lymphadenopathy is an early indicator of some diseases, therefore physical examination of lymph nodes of head and neck is of great importance.
- And one important responsibility of dental professional is to detect and record abnormal lymph nodes

LYMPH NODE

- Lymph nodes are bean shaped organs found in clusters along the distribution of lymph channels of the body.
- Every tissue supplied by blood vessels is supplied by lymphatic's except placenta and brain.
- There are over 800 lymph nodes in the body and around 300 are located in the head and neck
- Lymph nodes usually occur in groups and are **strategically arranged** at various sites in the body.

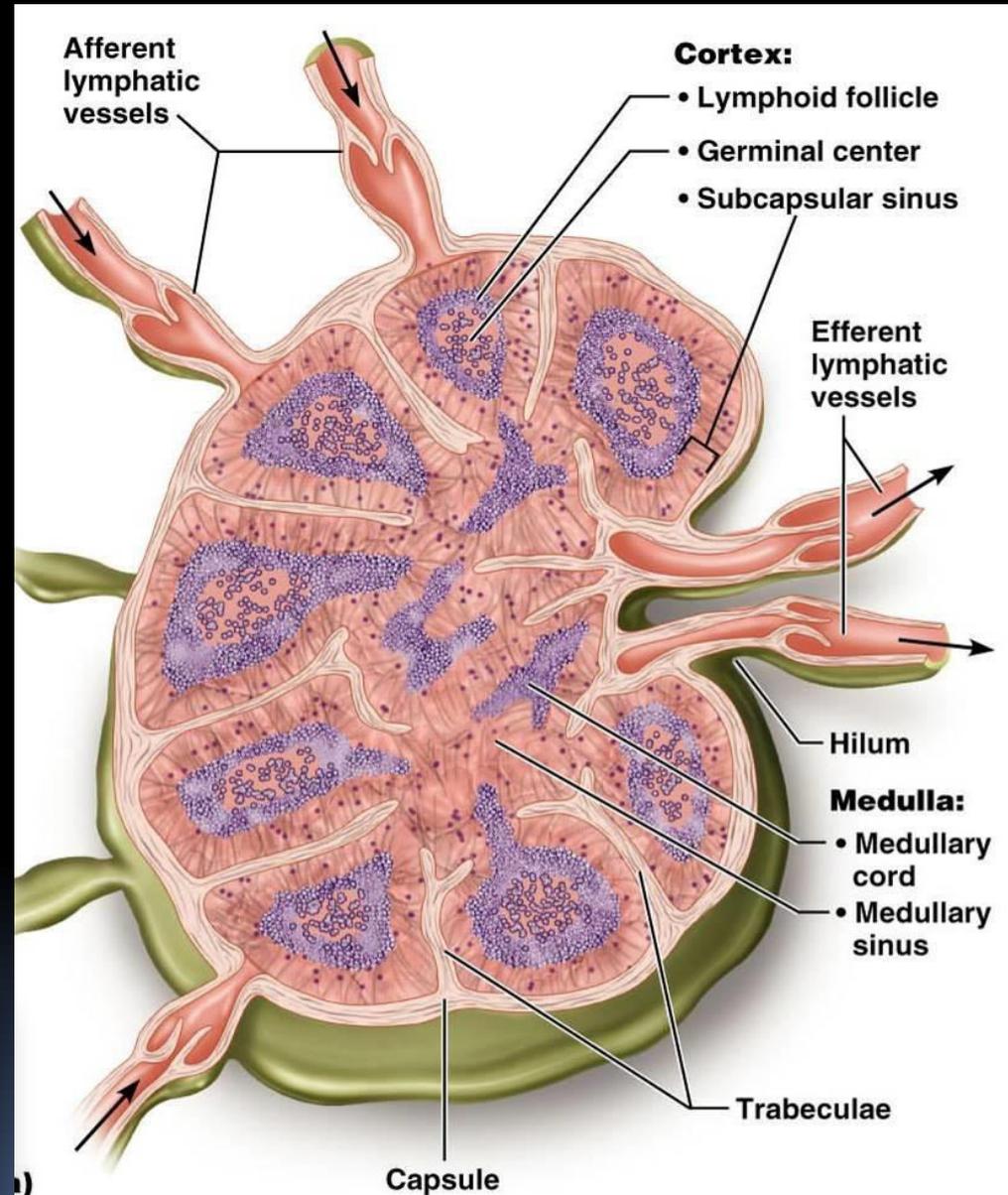
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- The superficial nodes are located in the subcutaneous connective tissue, and deeper nodes lie beneath the fascia & muscles and within various body cavities.
 - They are numerous and tiny, but some may have size as large as 0.5 to 1 cm in diameter.
 - The superficial nodes are the gateways for assessing the health of the entire lymphatic system

ANATOMY

Each lymph node is a bean shaped organ, with an outer connective tissue frame work, which dips into the structure forming numerous septa.

Node has an outer convex surface and an inner concave surface- the **Hilum**

Afferent vessels enter.
Efferent vessels exit
Blood vessels



HISTOLOGY

TWO ZONES:

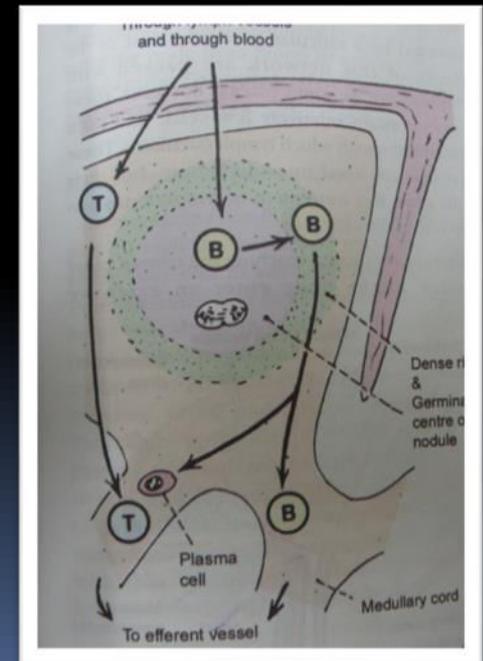
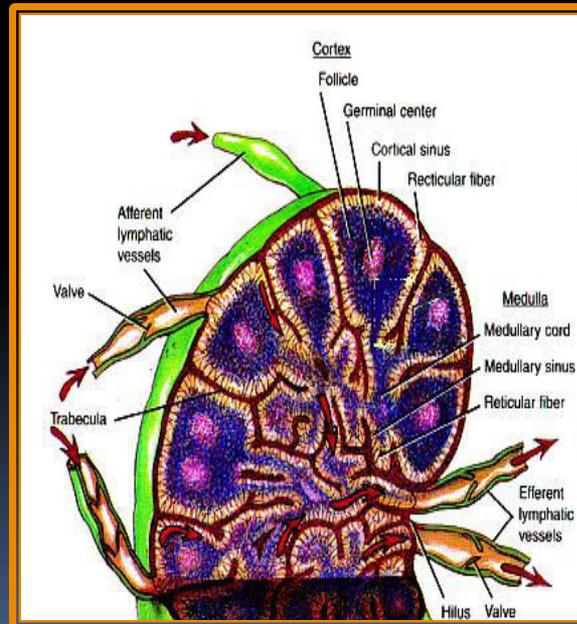
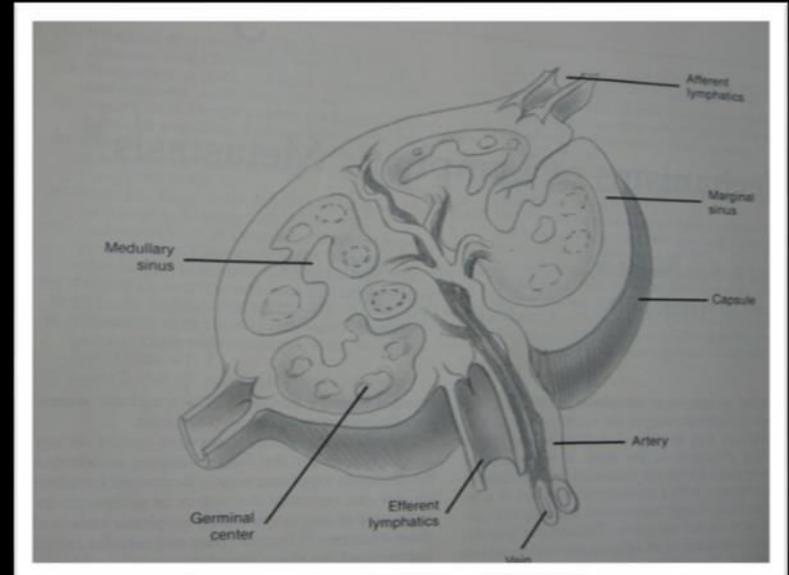
- A darkly staining cortex
- And a lightly staining medulla

CORTEX:

- Several rounded areas { lymphatic follicles }
- Paler germinal center which contain actively dividing B-lymphocytes.
- The para-follicular area contains T-lymphocytes

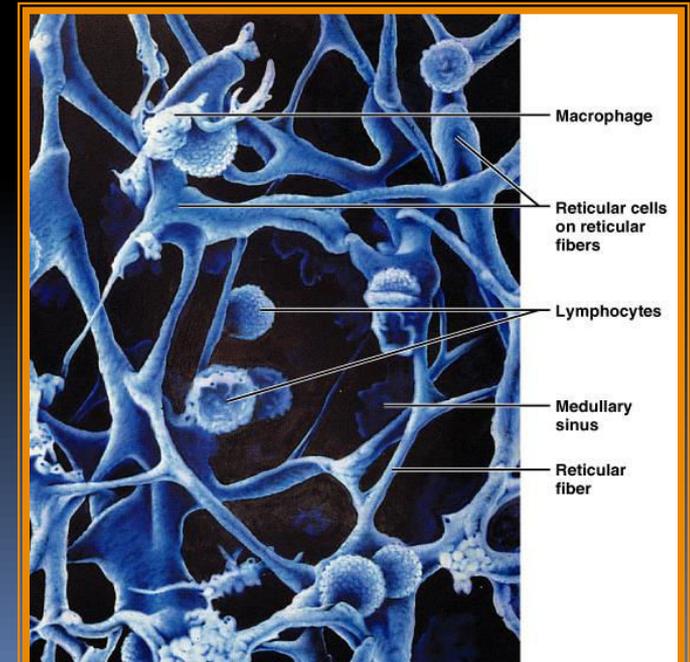
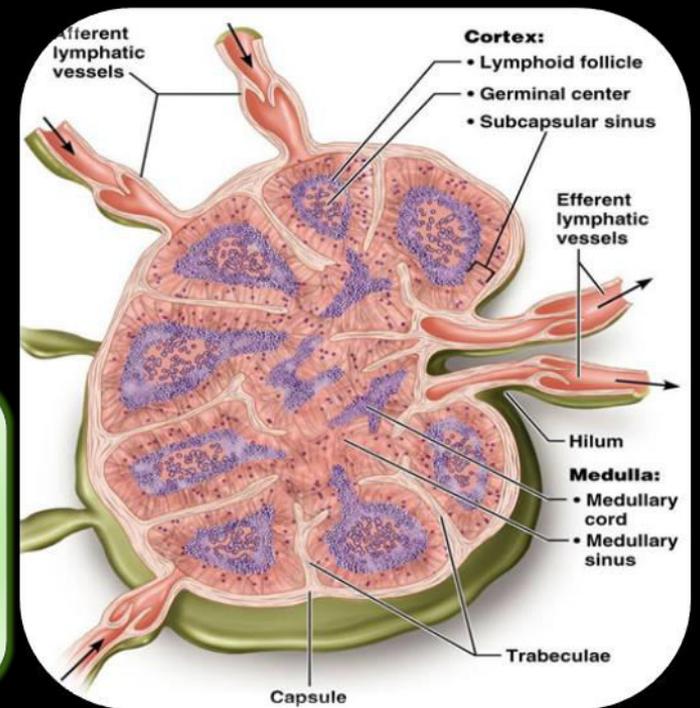
MEDULLA:

- Lymphocytes arranged less densely in the form of cords along the reticular network
- Sinusoids are present for free flow of lymph



Lymph passing through these sinuses comes in intimate contact with macrophages & lymphocytes present in the node.

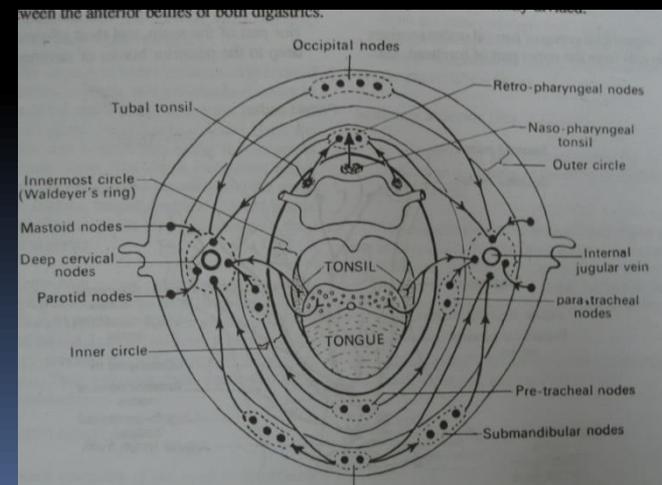
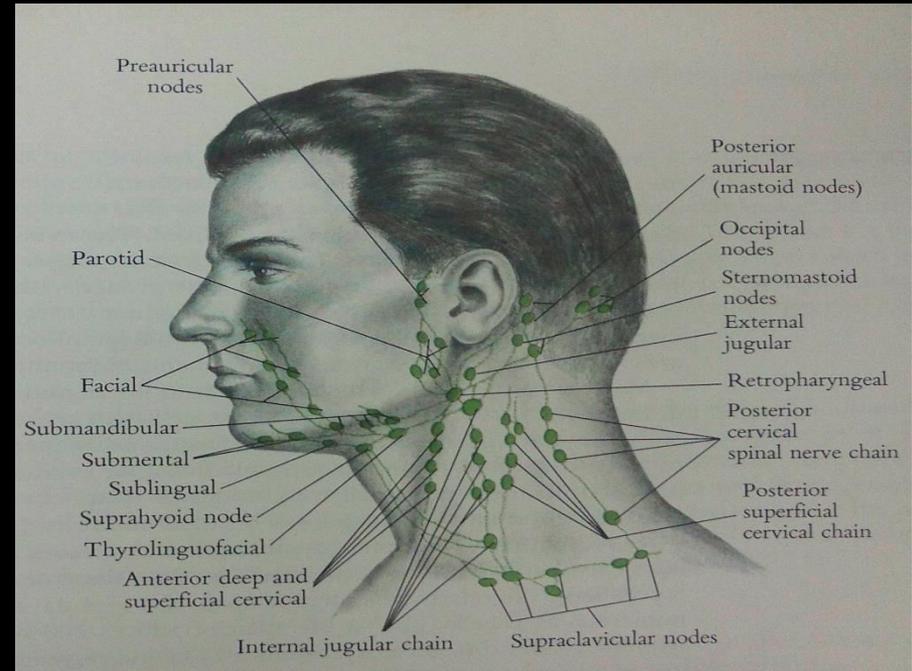
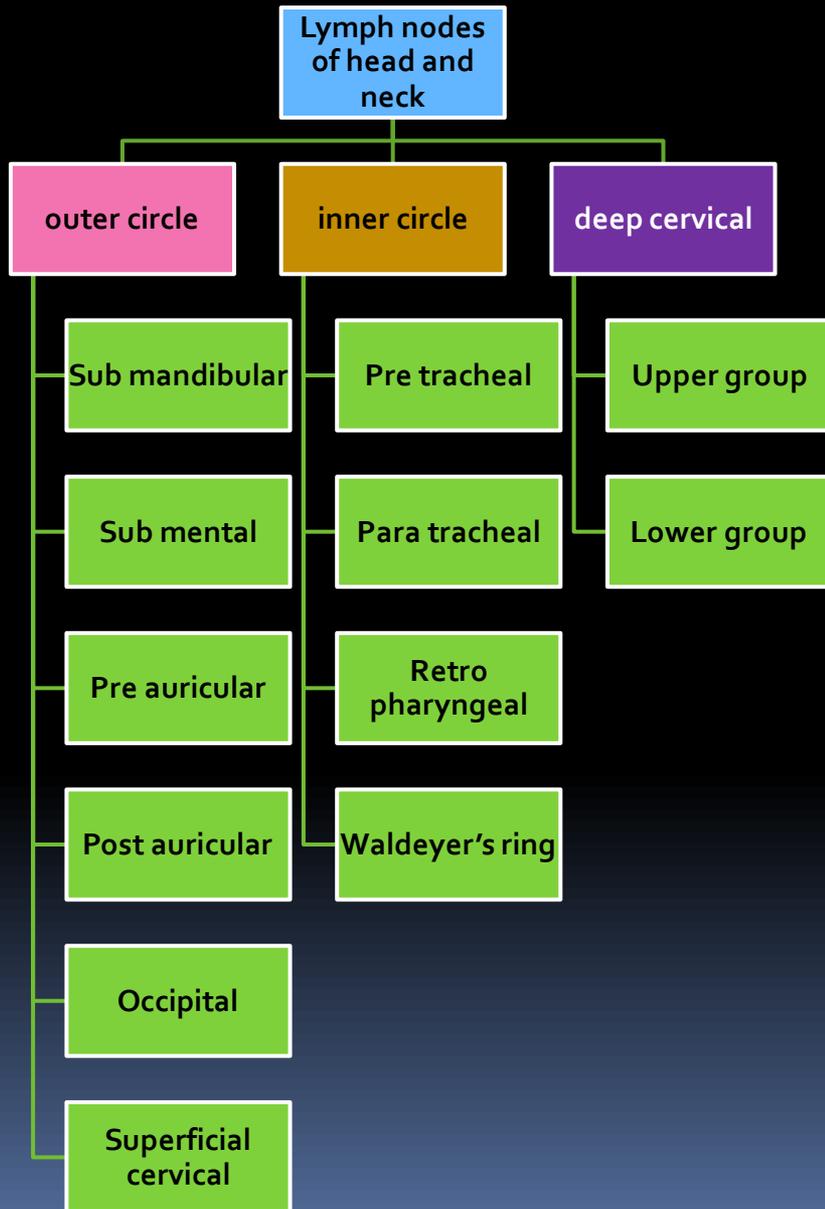
Bacteria and other particulate matter present in the lymph are filtered by these cells



FUNCTION

- They are **centers of lymphocyte production**. Both B-lymphocytes and T-lymphocytes are produced here by multiplication of pre-existing lymphocytes.
- **Filter** the products from **lymph** such as bacteria and other particulate matter and to prevent their entry into systemic circulation.
- The antibodies produced by the B-Lymphocytes are carried to the circulation... and indirectly help in mounting an **immune response**.

Classification of lymph nodes

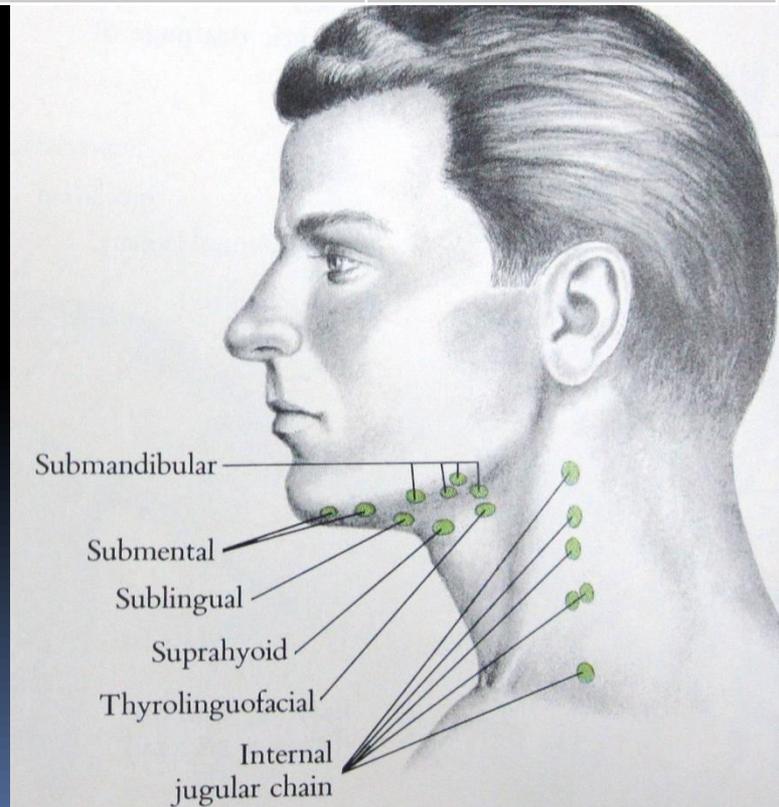




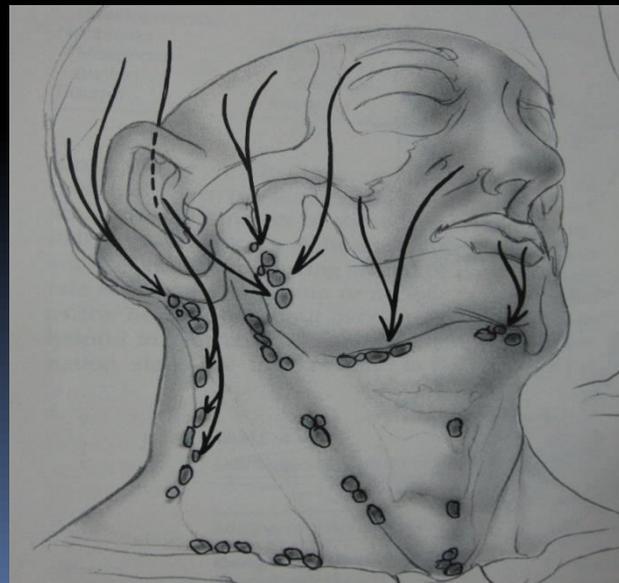
Draining area



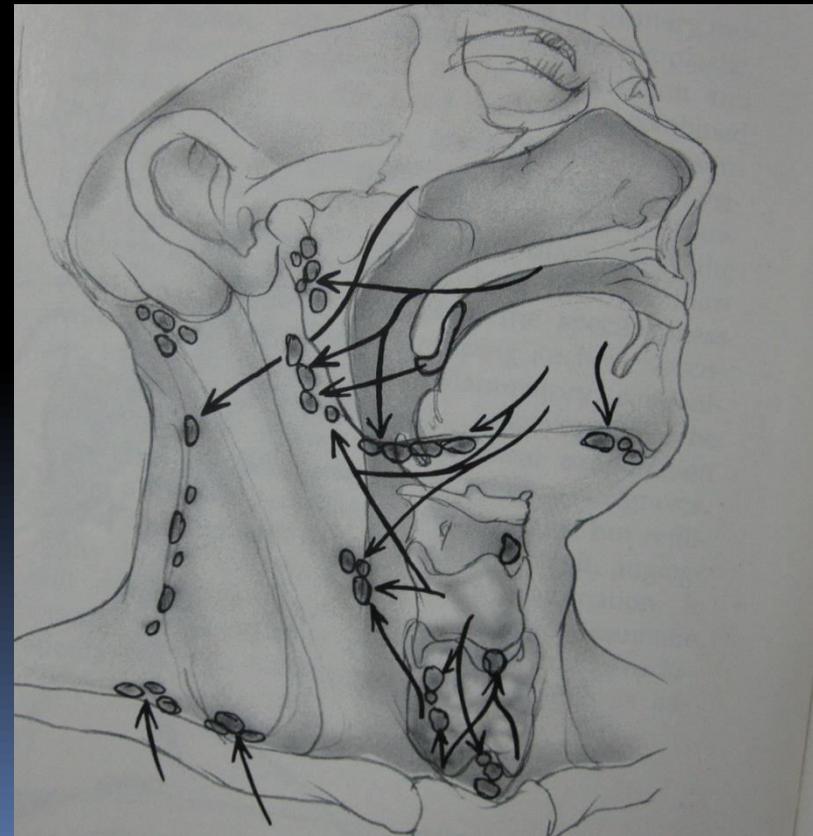
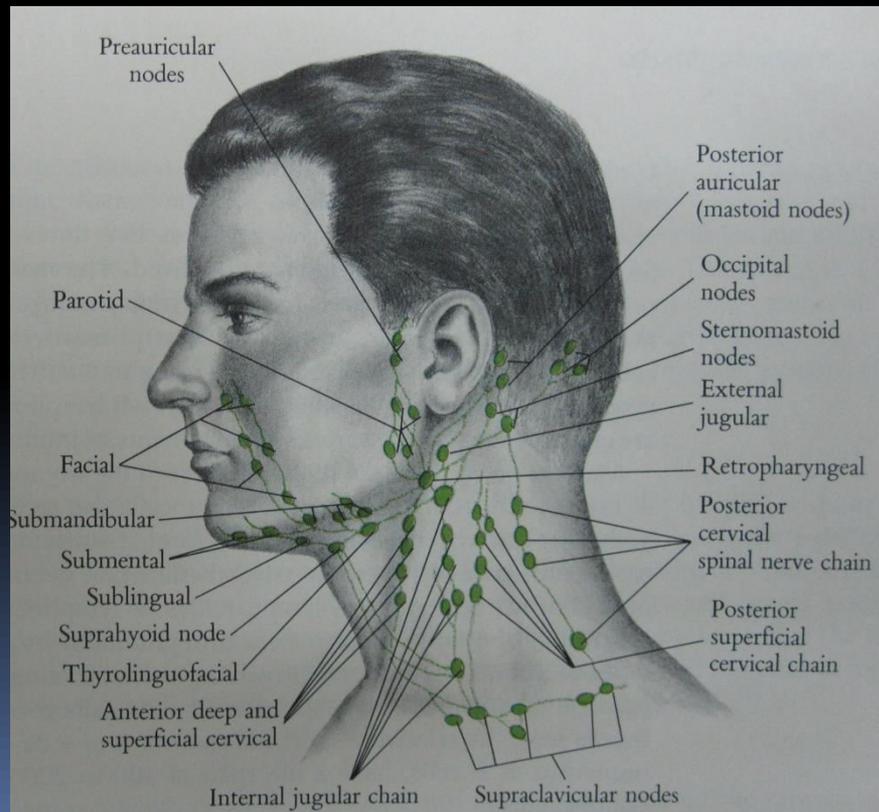
node	location	Draining area	Efferent's
SUB MENTAL	Under the chin in the sub mental triangle on the surface of mylohyoid muscle	Lower lip, the chin, tip of the tongue and the anterior floor of the mouth	Sub mandibular nodes or jugulo omohyoid group



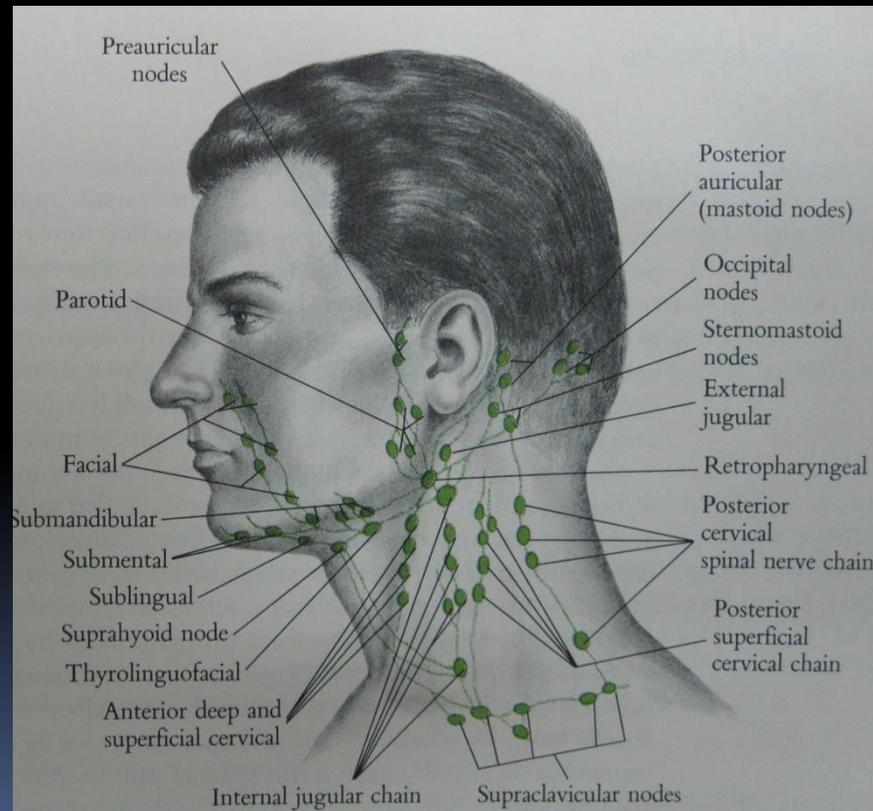
node	location	Draining area	Efferent's
SUB MANDIBULAR	<p>Lie within the submandibular region scattered over the surface of sub mandibular salivary gland.</p> <p>An extension of the submandibular group lie on the cheek superiorly called the buccal group</p>	<ul style="list-style-type: none"> •Sub mental nodes •Cheek •Nose •Upper lip •Maxillary teeth •Vestibular gingiva •Posterior floor of the mouth and the •Tongue 	Drain into nodes of deep cervical chain



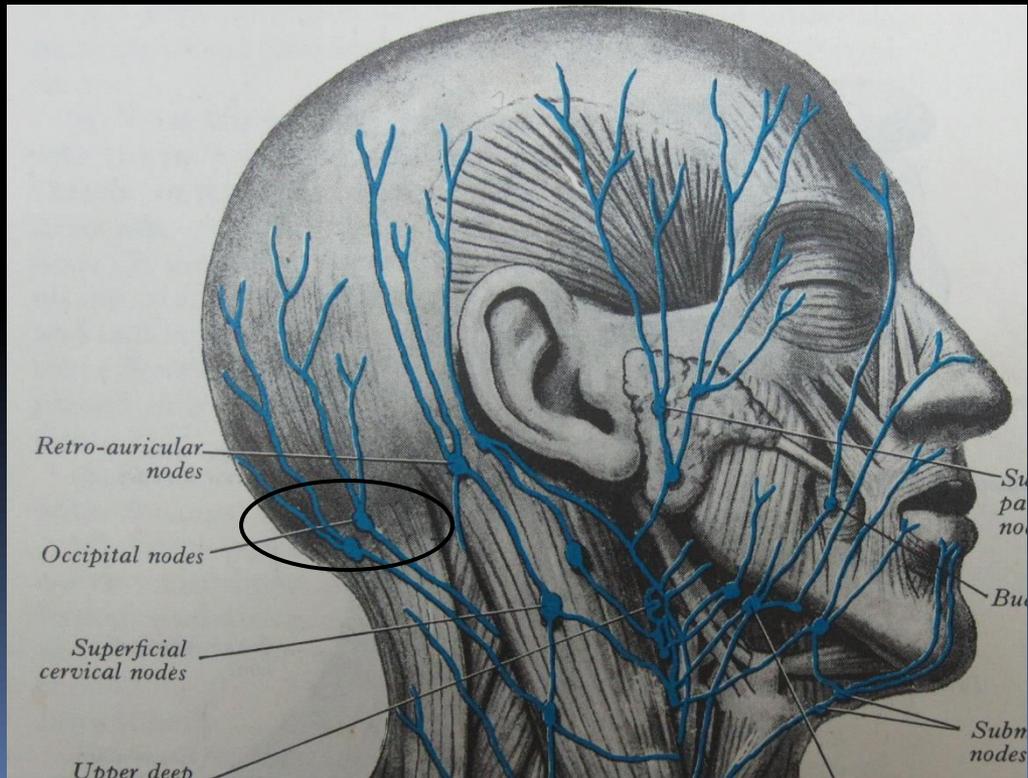
node	location	Draining area	Efferent's
PAROTID NODES	Lie superficial to the capsule of parotid gland	<ul style="list-style-type: none"> • the eye lid • temple • prominence of cheeks and • the auricle 	<ul style="list-style-type: none"> • deep parotid nodes • Superficial cervical nodes



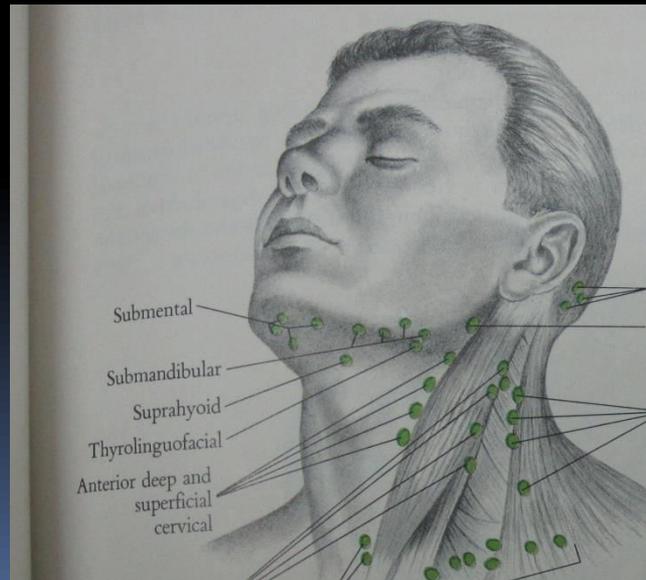
node	location	Draining area	Efferent's
RETRO AURICULAR NODES	Lie over the mastoid process	<ul style="list-style-type: none"> • The Scalp • The Auricle 	Deep cervical nodes



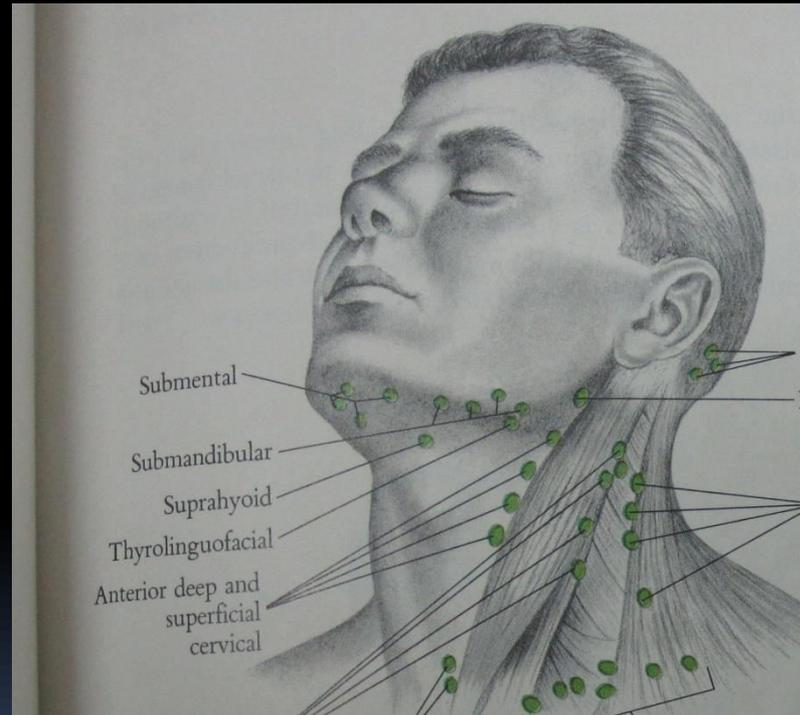
node	location	Draining area	Efferent's
OCCIPITAL	Lie just below the superior nuchal lines atop the trapezius muscle and in proximity with occipital artery	From scalp	Drain to deep cervical nodes



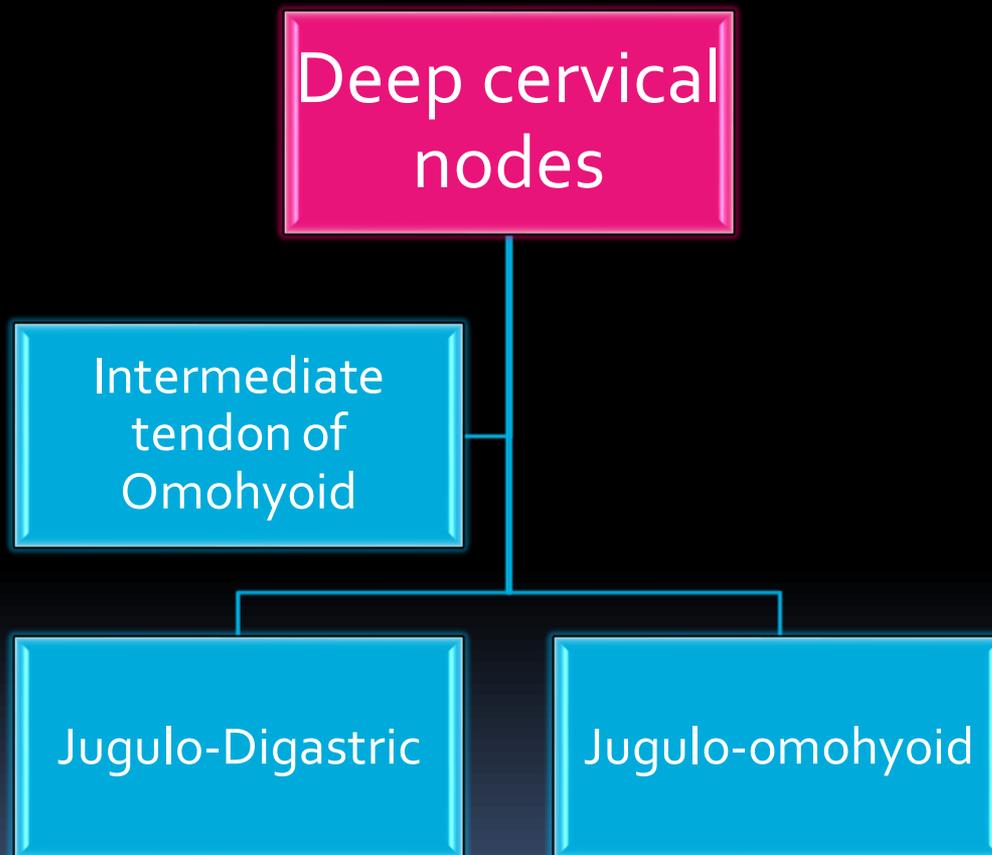
Node	Location	Draining area	Efferent's
SUPERFICIAL CERVICAL	3-4 nodes lie along the ext jugular vein and are situated superficial to upper part of sterno-cleido mastoid	<ul style="list-style-type: none"> • floor of ext acoustic meatus • Lobule of the ear • angle of the jaw 	Lower deep cervical nodes



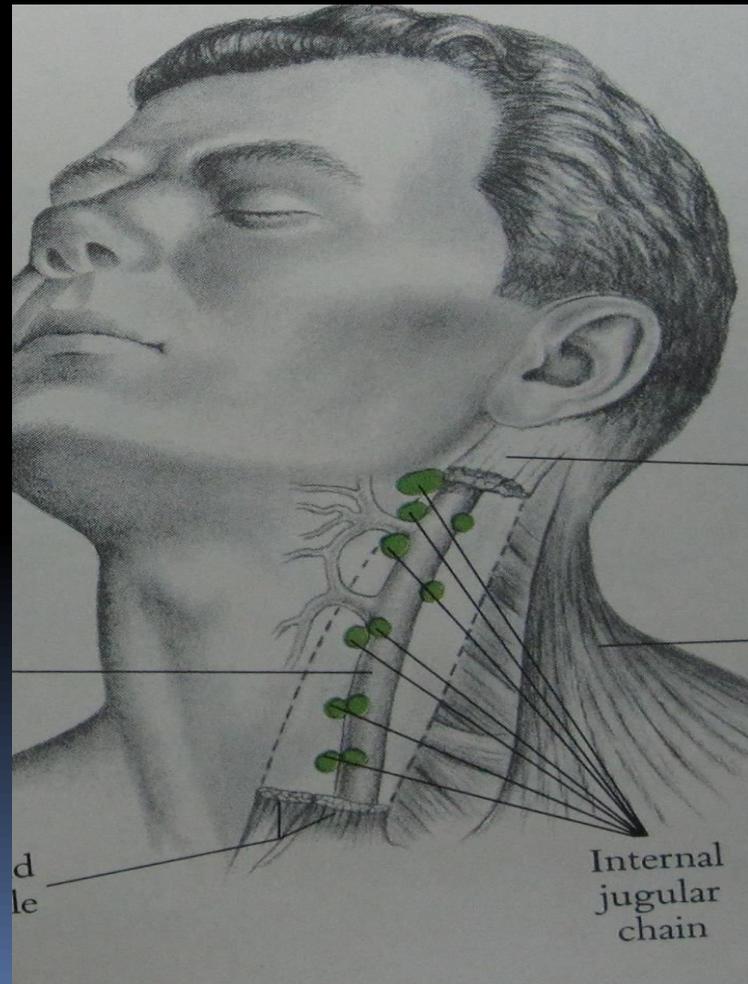
node	location
ANTERIOR & POSRERIOR CERVICAL NODES	Superficially along the sterno mastoid



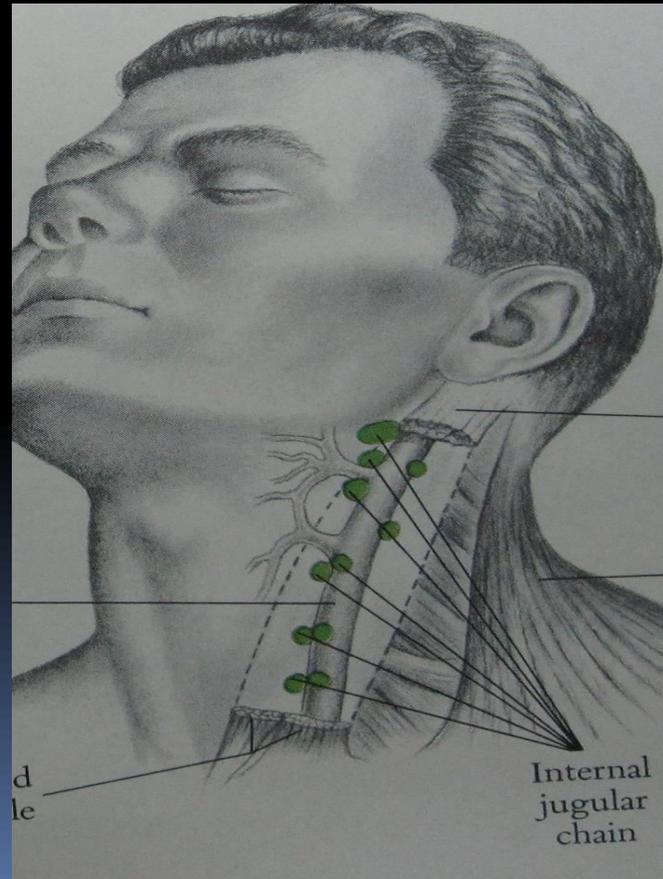
node	location
DEEP CERVICAL NODES	These are arranged mostly along and around Internal Jugular Vein, & lie mostly under cover of Sternomastoid



node	location	Draining area	Efferent's
JUGULO-DIGASTRIC	Below the posterior belly of digastric	<ul style="list-style-type: none"> •Palatal tonsils •Posterior 1/3rd of tongue 	Lower group of Deep Cervical nodes



node	location	Draining area	Efferent's
JUGULO- OMOHYOID	On the Internal Jugular Vein , just below the intermediate tendon of Omohyoid	• Directly from the tongue and indirectly from submental, submandibular, upper deep Cervical nodes.	Thoracic duct

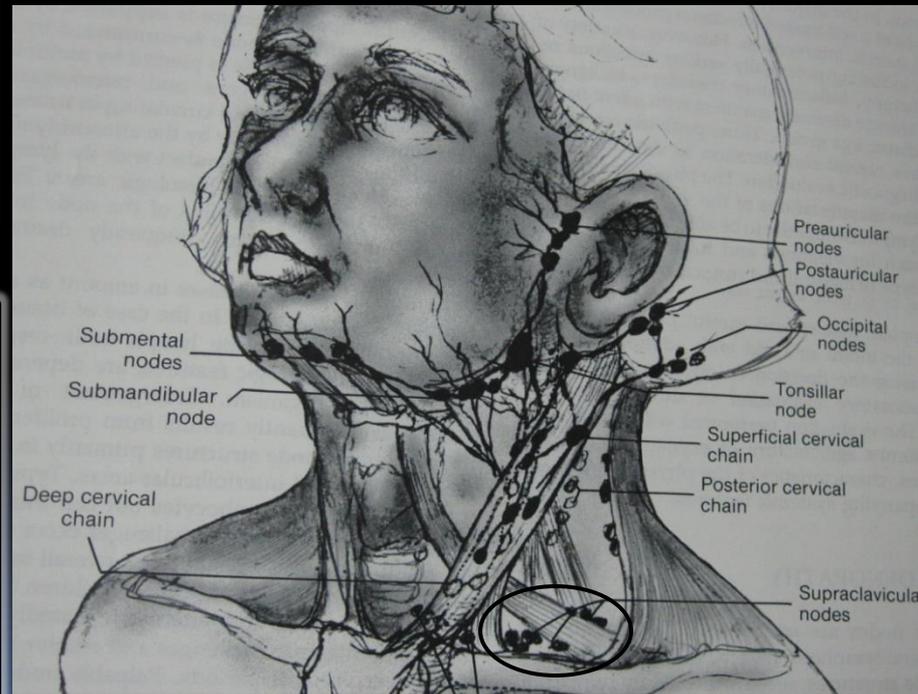


node	location	Draining area	Efferent's
SUPRA CLAVICULAR NODES	Supra clavicular triangle	<ul style="list-style-type: none"> •Axillary •Thorax •Abdomen •pelvis 	Thoracic duct

Some cancers ex: Stomach cancer, can remain symptomless while metastasizing. One of the first visible spots where these tumors metastasize is the left supra clavicular lymph node.

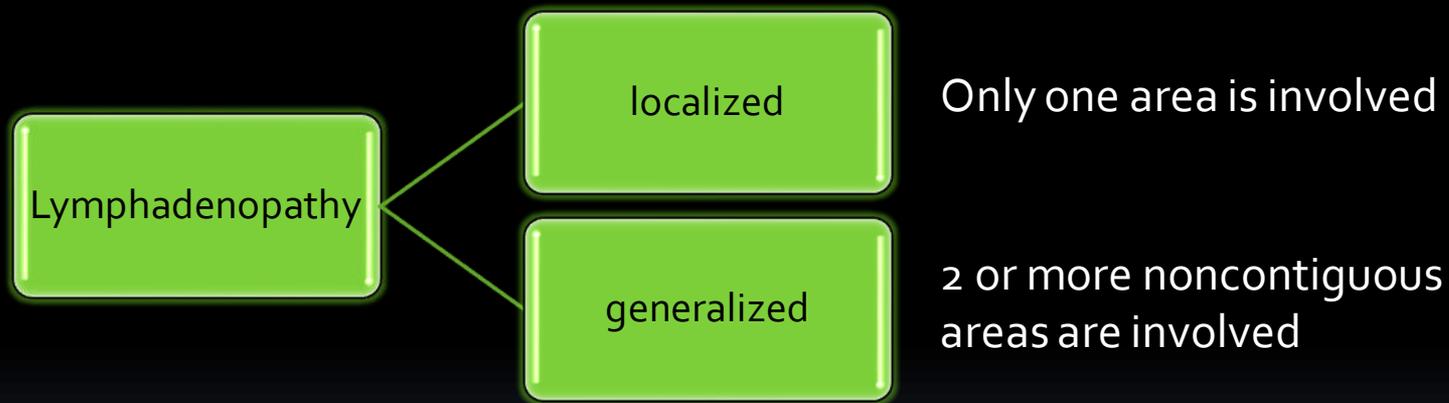
It is named after Rudolf Virchow (1821-1902), the German pathologist who first described the association.

The presence of an enlarged Virchow's node is also referred to as Troisier's sign, named after Charles Emile Troisier, who also described this



lymphadenopathy

Defn: Lymph nodes that are abnormal in either size or consistency.



Causes

It results from a vast array of disease processes whose broad categories are easily recalled using the mnemonic **"MIAMI"** representing

- Malignancies,
- Infections,
- Autoimmune disorders,
- Miscellaneous and unusual conditions, and
- Iatrogenic causes.

infections

bacterial

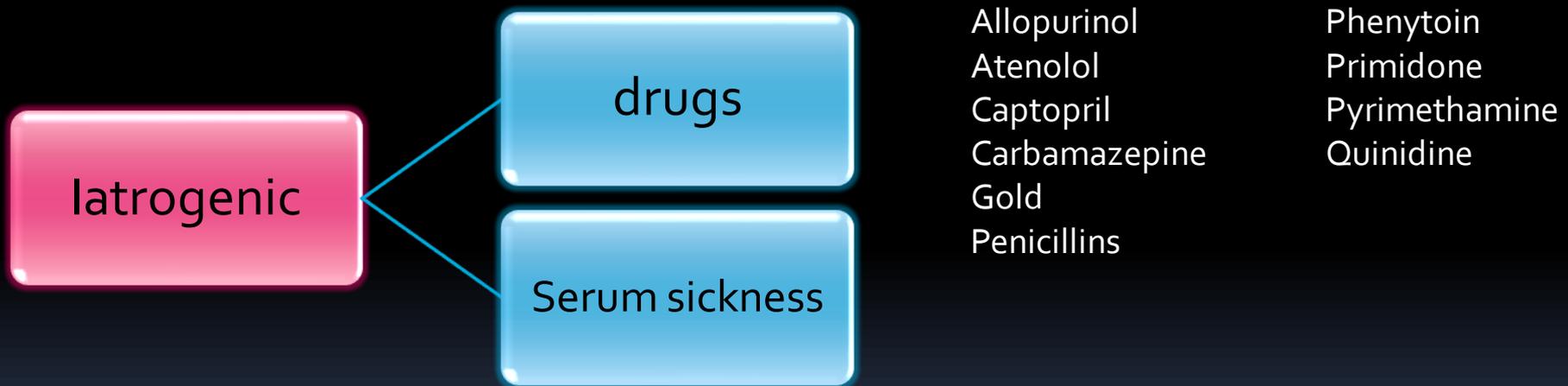
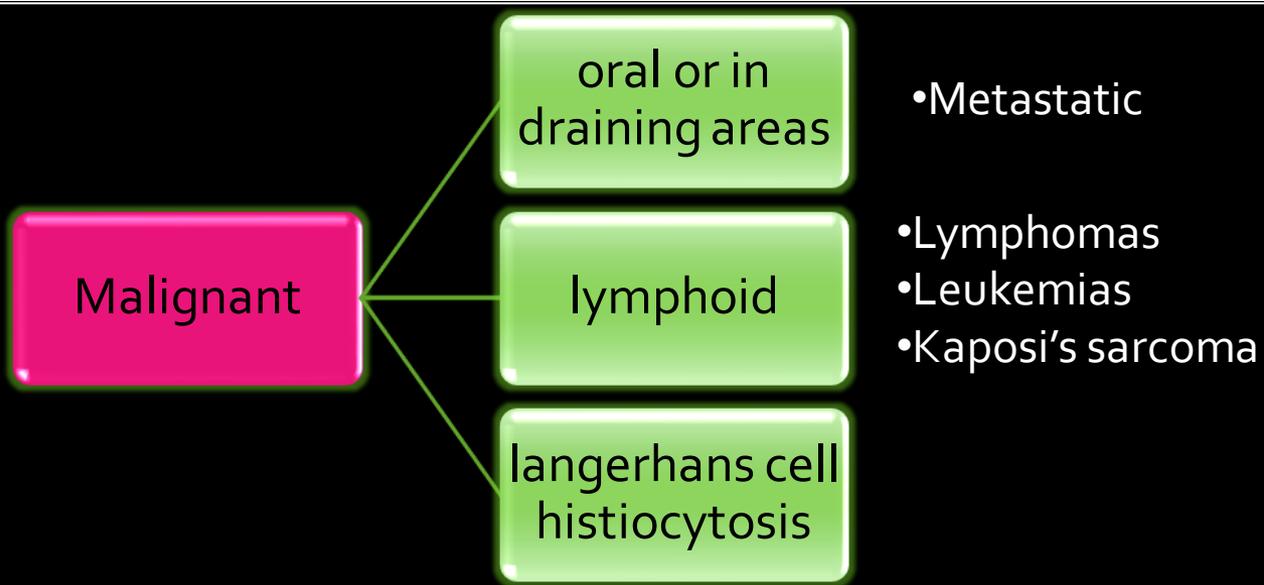
- Dental
- Ear
- Nose
- Throat
- Scalp
- Cat-scratch disease
- Mycobacterial lymphadenitis

viral

- URT infections
- Oral
- Infectious mononucleosis
- Cytomegalovirus
- HIV infection

fungual

- Histoplasmosis
- Blastomycosis



MISCELLANEOUS

Mucocutaneous lymph node syndrome

Sarcoidosis

AUTOIMMUNE

Lupus erythematosus

Rheumatoid arthritis

Pathogenesis

- Lymph nodes undergo reactive changes in response to wide variety of stimuli including:
 - Microbial infections
 - Drugs
 - Environmental pollutants
 - Tissue injury
 - Immune reactions
 - neoplasia
- Reactive lymphadenitis could be
 - Acute non specific
 - Chronic non specific

Acute non specific:

- All kinds of acute inflammation can cause this
- Most common causes include
 - Microbial infection
 - Their breakdown products
 - Foreign body etc....
- The lymphoid follicles become enlarged due to mitosis
- The sinuses are congested, dilated and oedematous
- In more severe cases necrosis may occur and abscess formation can occur.

Chronic non specific

- Commonly called **benign reactive lymphoid hyperplasia**. Occurs due to repeated attacks of acute lymphadenitis and from malignant tumors.
- Commonly the involved lymph nodes are enlarged, firm and tender.
- Follicular hyperplasia
 - Early Tuberculosis
 - Toxoplasmosis
 - Syphilis and AIDS
- Para cortical lymphoid hyperplasia
 - Immunologic reactions to drugs
 - Vaccination
 - Viruses,
 - Auto immune disorders
- Sinus hyperplasia
 - Lymph nodes draining malignancies
 - Sinus histiocytosis
- Granulomatous:
 - Sarcoidosis
 - Late tuberculosis
 - Berylliosis

Malignancies:

- The entire nodal architecture is replaced by proliferating malignant cells.
 - Nodular form
 - Diffuse form
- The metastatic malignant cells migrate to the nodes through the channels, get deposited and proliferate here.

- 
- Lymphoid tissue increases in amount as a result of antigenic stimulation
 - Enlargement of lymph node most frequently results from proliferation of intrinsic lymph node structures primarily in the germinal follicles and interfollicular areas.
 - Repeated challenges causes an overall increase in lymphoidal tissue.
 - In some cases nodes become infected by filtered lymph from an infected area and develop inflammatory changes similar to the primary involved tissue, In addition to primary proliferative responses.
 - Lymph node enlargement also develops from invasion of node by extrinsic .

CLINICAL EVALUATION

- HISTORY
- PHYSICAL EXAMINATION
 - Inspection
 - palpation

History

AGE & DURATION

- The rate of malignant aetiologies of lymphadenopathy is very low in childhood, but increases with age.
- Lymph nodes are palpable as early as the neonatal period, and a majority of healthy children have palpable cervical adenopathy. The vast majority of cases of lymphadenopathy in children is infectious aetiology.

- Lymphadenopathy that has been present for less than 2 weeks has a very low chance of representing a malignant condition
- Additionally, lymphadenopathy that has been present for more than 1 year and has been stable in size over the year has a very low chance of being malignant
- However, exceptions to the latter may include indolent non-Hodgkin's and low-grade Hodgkin's lymphomas

most cases of lymphadenopathy resolve quickly, some entities such as atypical mycobacteria, cat-scratch disease, toxoplasmosis, Kikuchi's lymphadenitis, sarcoidosis, and Kawasaki's syndrome can create persistent lymphadenopathy for many months, and may be confused with neoplasms.

Exposure history

A complete exposure history is essential to determining the etiology of lymphadenopathy.

Exposure to animals and biting insects, chronic use of medications, infectious contacts, and a history of recurrent infections are essential in the evaluation of persistent lymphadenopathy.

Travel-related exposures and immunization status should be noted

Personal and occupational history

Environmental exposures such as tobacco, alcohol, and ultraviolet radiation may raise suspicion for metastatic carcinoma of the internal organs, cancers of the head and neck, and skin malignancies,

Occupational exposures to silicon or beryllium may also lead to lymphadenopathy.

Sexual history and orientation are important in determining potentially sexually transmitted causes of inguinal and cervical lymphadenopathy.

Family history

may raise suspicion for certain neoplastic causes of lymphadenopathy, such as carcinomas or tuberculosis.

- a complete exposure history, review of associated symptoms, and a thorough regional examination help determine whether lymphadenopathy is of benign or malignant origin

Patients with acquired immunodeficiency syndrome (AIDS) have a broad differential of causes of lymphadenopathy, and rates of malignancies such as Kaposi's sarcoma and non-Hodg-kin's lymphoma are increased in this group

ASSOCIATED SYMPTOMS:

- A thorough review of systems is important
- Knowledge of associated factors is critical to determining the management of unexplained lymphadenopathy.
- Constitutional symptoms such as fever, malaise, fatigue, cachexia, unexplained loss of weight, loss of appetite,
- Fever: Adenopathy in the presence of fever points toward a broad differential, mainly consisting of infection or lymphoma
 - Evening raise
 - Pel Ebstein fever
- arthralgia, muscle weakness, unusual rashes may indicate possibility of autoimmune diseases.
- Symptoms associated with lymphadenopathy that should be considered red flags for malignancy include fevers, night sweats, and unexplained weight loss (>10% of normal body weight)

Physical examination

The physical examination should be regionally directed by ***knowledge of the lymphatic drainage patterns*** and should include a complete lymphatic examination looking for generalized lymphadenopathy.

INSPECTION:

- Swellings at the known sites of lymph nodes should be considered to have arisen from them unless some outstanding clinical findings prove their origin to be otherwise.
- All the normal anatomic sites should be inspected for any obvious enlargements

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- When lymphadenopathy is localized, the clinician should examine the region drained by the nodes for evidence of infection, lesions or tumors.
 - Other nodal sites should also be carefully examined to exclude the possibility of **generalized lymphadenopathy.**
- 

- The lymphadenopathy are examined in the same fashion as any other swelling.
- That means number, site, size, surface



Number: is important to know whether a single or multiple groups are involved.

- A few conditions are known to cause generalized lymphadenopathy
- Eg: Lymphomas, Tuberculosis, lymphatic leukemia, Brucellosis, Sarcoidosis etc...

Position: is important as it will not only give an idea as to which group of lymph node is affected, but also the diagnosis.

- Eg: Hodgkin's disease and the Tuberculosis affect the cervical lymph nodes in the earlier stages,

SKIN OVER THE SWELLING:



in acute lymphadenitis the skin becomes inflamed with redness, edema and brawny induration



In chronic lymphadenitis such angriness is not seen



Skin over tuberculous lymphadenitis becomes red and glossy when they reach the point of bursting. Scar often indicates previous bursting of abscess or operation.



Over a rapidly growing lymphoma, the skin appears tense, stretched with dilated subcutaneous veins.



In secondary carcinoma, the skin may become fixed.

Palpation



Most of the lymph nodes are best palpated with the examiner standing behind the patient who is comfortably seated in a dental chair



Palpation of the lymph nodes is ideally done commencing from the most superior lymph node and then working down to the clavicle region.



Nodes are palpated for consistency, size, tenderness, fixity to the surrounding structures.

Consistency

- Enlarged lymph nodes should be palpated carefully with palmar aspect of 3 fingers.
- While rolling the fingers over the lymph node, slight pressure has to be applied to know the consistency of the node.
- Enlarged lymph nodes could be
 - Soft (fluctuant)
 - Elastic, rubbery
 - Firm,
 - Stony hard
 - Variable

Tenderness



When a lymph node increases in size its capsule stretches and causes pain.



But pain may also be seen when there is hemorrhage into the necrotic center of a malignant node.



The presence or absence of tenderness does not necessarily differentiate benign from malignant nodes.

Matting

A group of lymph nodes that feels connected and move as a unit is said to be matted

Nodes that are matted could be

Malignant

- Metastatic carcinoma
- lymphomas

Benign

- Tuberculosis
- Sarcoidosis
- Lymphogranuloma venerium

SIZE:

- Nodes are generally considered to be normal if they are up to 1cm in diameter.
- Little information exists to suggest that a specific diagnosis can be based on size alone.
- But in a study on a series of 213 adults with unexplained lymphadenopathy showed
 - Up to 1cm- no cancer
 - Up to 2.25 cm- 8% cancer
 - >2.25 cm- 38% cancer

Fixity to the surrounding tissues

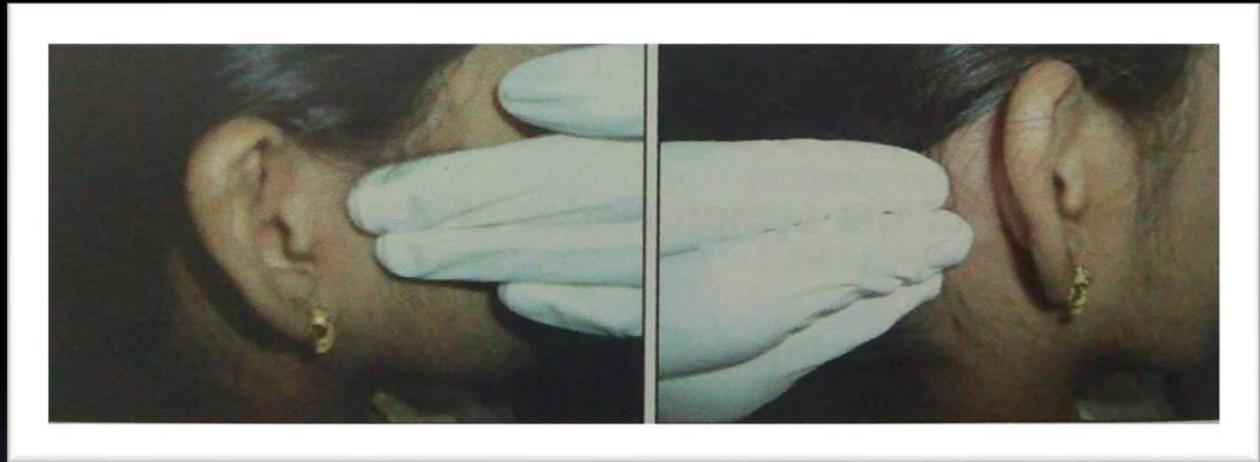
- The enlarged nodes should be carefully palpated to know if they are fixed to the skin, deep fascia, muscles etc..
- Any primary malignant growth or secondary carcinoma is often fixed to the surroundings.
- First the deep fascia and the underlying muscle, the surrounding structures and finally the skin is involved.
- **Upper deep cervical lymph nodes** when involved secondarily from any carcinoma of its drainage area may involve the hypoglossal nerve and cause hemiparesis of the tongue which will be deviated towards the side of the lesion when asked to protrude out.
- Cases are not uncommon when patient may complain of dyspnoea & dysphagia due to pressure on trachea or esophagus by enlarged lymph nodes from **Hodgkin's disease** or **secondary carcinoma**

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Method of palpation

PRE AURICULAR NODES

They are palpated anterior to the tragus of the ear



POSTERIOR AURICULAR NODES

Are palpated behind the ear, on the mastoid process



OCCIPITAL NODES

Palpated at the base\lower border of skull

Sub mental nodes

- They are palpated under the chin
- The clinician can stand behind the patient to palpate.
- The patient is instructed to bend his/her neck slightly forward so that the muscles and fascia in that regions relax.
- Fingers of both hands can be placed just below the chin, under the lower border of mandible and the lymph nodes should be tried to be cupped with fingers.



**Sub
mandibular
nodes**



Are palpated at the lower border of the mandible approximately at the angle of the mandible.

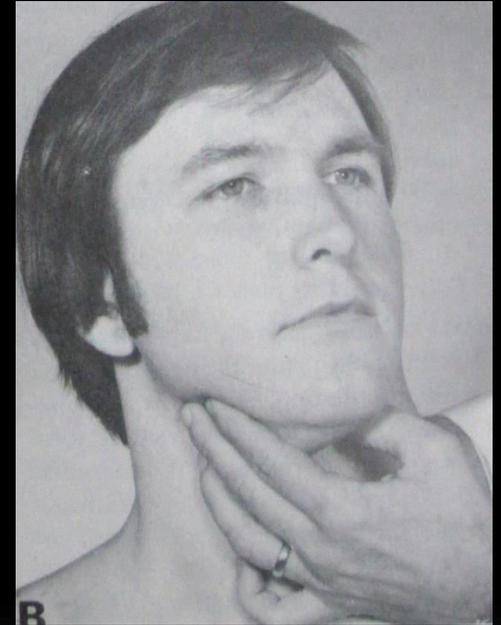
The patient is instructed to passively flex the neck towards the side that is being examined. This maneuver helps relaxing the muscles and fascia of neck, thereby allowing easy examination.

The fingers of the palpating fingers should be kept together to prevent the nodes from slipping in between them.

The palmar aspect of the fingers is pushed on to the soft tissue below the mandible near the midline, then the clinician should then move the fingers laterally to draw the nodes outwards and trap them against the lower border of the mandible.

**Superficial
cervical
nodes**

are situated superficial to upper part of sterno-cleido mastoid along its anterior border.



**Posterior
superficial
nodes**

Palpated in the posterior triangle of the neck close to the anterior border of trapezius

- Examination of the cervical nodes can be accomplished by instructing the patients to turn the neck away from the side to be examined.
- This position distends the Sterno mastoid muscle and facilitate easier examination of the lymph nodes of anterior and posterior chain.
- Finger tips of the hand are placed along the posterior border of muscle while the thumb provides counter pressure from the anterior aspect of the muscle

Lymph node status in various conditions

Condition	Status
Acute infections	The nodes become enlarged and painful. The overlying skin becomes warm, red, brawny oedematous. On palpation the node is extremely tender.. Soft and fluctuant when there is necrosis of nodal architecture.
Chronic infections	Clinically often difficult to distinguish from tubercular lymphadenitis in early stages. The nodes become moderately enlarged, slightly tender and elastic with or without matting.
Tuberculous lymphadenitis	Common in children and young adults. Cervical nodes are more frequently involved. Stage 1: nodes enlarge without matting Stage 2: due to the advent of periadenitis, the nodes become adherent to one another. Stage 3: caseation takes place in the interior of the nodes so that nodes become softer wiyh gradual formation of abscess. Later the abscess gradually makes its way towards the surface and bursts out forming a typical sinus.

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Condition	Status
Syphilitic lymphadenitis	Intra oral Chancres _____ inflamed painful, matted Secondary stage _____ generalized(occipital)
Cat scratch disease	The regional lymph nodes are commonly involved... lymphadenopathy is often seen after 1-2 weeksthe nodes are enlarged, painful and suppuration usually occurs in due course.
Viral infections	Commonly submandibular nodes are involved. The nodes are typically bilateral, small, soft, freely mobile and non tender
Infectious mononucleosis	Generalized involvement with firm, elastic and slightly tender nodes.

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Ref: The neck: diagnosis and surgery Shockley

Ref: The neck: diagnosis and surgery Shockley

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Malignancies	<ul style="list-style-type: none">•hard and painless . Sometimes painful•key risk factors for malignancy include older age, firm, fixed nodal character, duration of greater than two weeks, and supraclavicular location.
Hodgkin's lymphoma	firm, fixed, circumscribed, and rubbery

Lymph nodes may be enlarged reactively and even small lymph nodes may be infiltrated by malignant cells. Besides the size, presence of necrosis is the strongest indicator for metastatic disease, but necrosis has been shown to occur in benign conditions as well

Investigations

Unexplained lymphadenopathy without signs or symptoms of serious disease or malignancy can be observed for one month, after which specific imaging or biopsy should be performed

fine-needle aspiration, excisional biopsy remains the initial diagnostic procedure of choice.

Modern cross-sectional imaging modalities such as ultrasound (US), computed tomography (CT) and magnetic resonance (MR) imaging allow reliable detection of cervical lymph nodes. However, the differentiation between benign and malignant lymph nodes remains challenging

Alternative imaging modalities such as single photon emission computed tomography (SPECT) and positron emission tomography (PET) can help to differentiate between benign and malignant lymph nodes

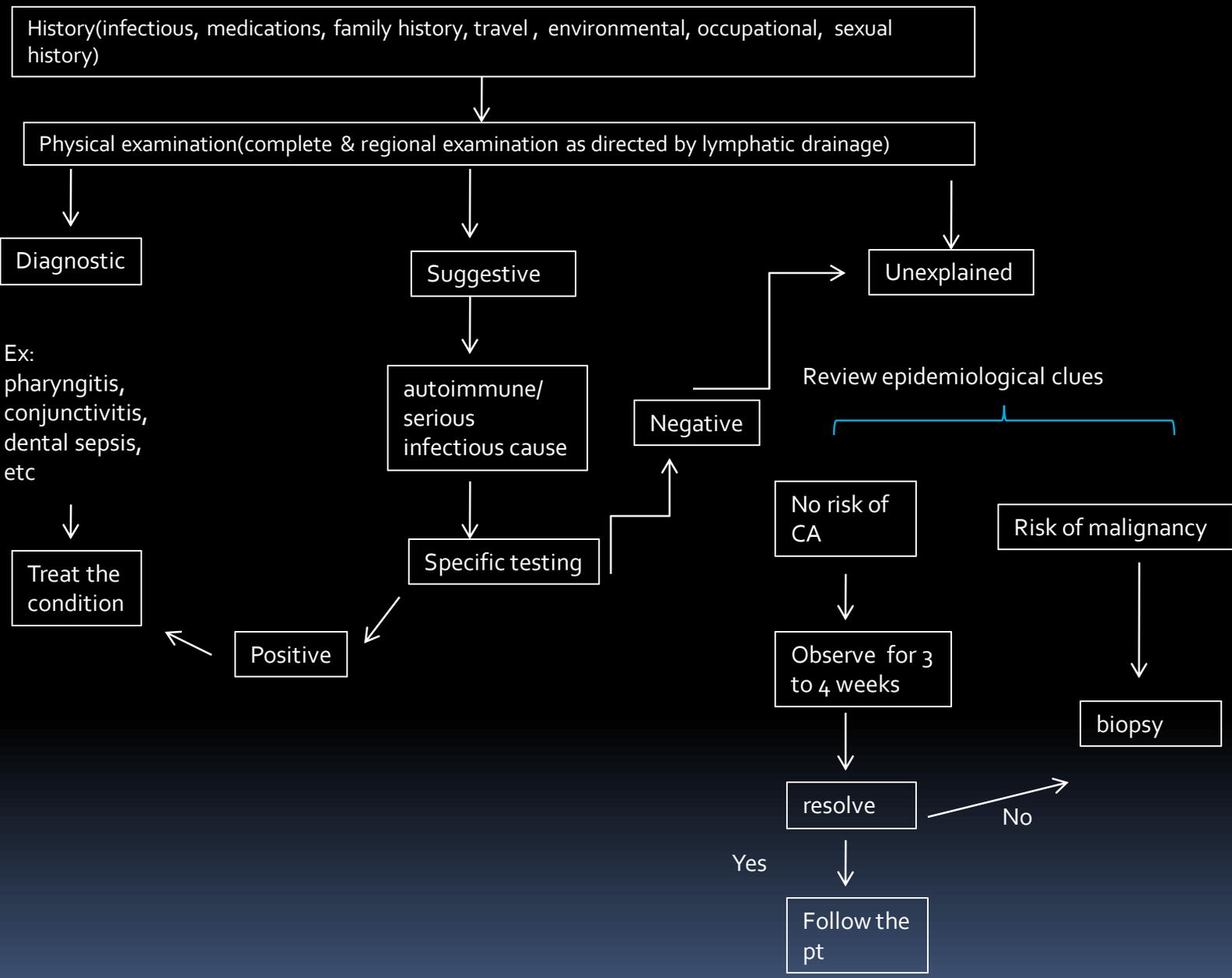
In a recent meta-analysis, ultrasound and US-guided fine needle aspiration cytology (USgFNAC) have been shown to be valuable tools in characterizing cervical lymph nodes,

European Journal of Radiology 72 (2009) 381–
387

Sentinel node biopsy has greater accuracy in determining lymph node status for cancer than current commonly used imaging methods.

CMAJ 2008;178(7):855-62

Diagnostic workup



Conclusion

Thank you